MEMORANDUM OF UNDERSTANDING

BETWEEN

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

OF THE UNITED STATES OF AMERICA

AND

THE COMISIÓN NACIONAL DE ACTIVIDADES ESPACIALES

OF THE REPUBLIC OF ARGENTINA

FOR COOPERATION ON

THE AQUARIUS/SAC-D MISSION

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Preamble

The National Aeronautics and Space Administration of the United States (hereinafter referred to as NASA), and

The Comisión Nacional de Actividades Espaciales of Argentina (hereinafter referred to as CONAE),

as the Parties to this Memorandum of Understanding (hereinafter the Parties),

TAKING INTO ACCOUNT the cooperation set forth in the Agreement between NASA and CONAE for Cooperation in the Civil Uses of Space, signed at Buenos Aires, August 6, 1991, as extended;

CONSIDERING that CONAE and NASA have conceived the Aquarius/SAC-D mission, intended to provide fundamental new global measurements of sea surface salinity, consistently with the objectives of CONAE's National Space Program and NASA's Earth Science Enterprise Strategic Plan;

RECOGNIZING the Letter of Agreement between CONAE and NASA concerning the development of the cooperative mission Aquarius/SAC-D, which entered into force on November 11, 2002;

CONSIDERING their cooperative effort that led to the successful SAC-C mission launched aboard a NASA Delta launch vehicle from Vandenberg Air Force Base in November 2000;

RECOGNIZING the need for a mission to collect data to understand better sea surface salinity with the precision, accuracy, resolution, and coverage needed to characterize salinity variations and investigate the related physical processes that link the Earth's water cycle, climate, and ocean;

RECALLING that the Aquarius/SAC-D mission, including CONAE participation, has been selected for development by NASA's Earth Science Enterprise through its Earth System Science Pathfinder (ESSP) Announcement of Opportunity (AO).

Have agreed as follows:

Article I – Purpose

This Memorandum of Understanding (MOU) defines the terms and conditions for cooperation between the Parties for the Aquarius/Satelite de Aplicaciones Cientificas-D (SAC-D) Mission, described in Article II below, including, inter alia, the managerial, technical, and operational interfaces that are necessary to ensure the continuity of and compatibility between the respective activities; the roles and responsibilities of the Parties; and their financial commitments.

Article II – Mission Description

1. The objective of this mission is to contribute to the understanding of the total Earth system and the effects of natural and human-induced changes on the global environment. The measurements performed by the Aquarius/SAC-D Mission will contribute to a better understanding of ocean circulation, the prediction of changes in this circulation, and its impact on Earth's climate and water cycle.

2. The Aquarius/SAC-D observatory comprises the SAC-D spacecraft provided by CONAE, the NASA-provided Aquarius instrument, the CONAE-provided instruments, including the New Infra Red Sensor Technology (NIRST) camera, the K-band radiometer which will provide complementary measurements of surface temperature, surface wind, sea ice, and rain, and the High Sensitivity Optical Camera, and the Data Collection Transceiver, and other third-party instruments. The Aquarius/SAC-D will be launched by a NASA-provided expendable launch vehicle, now planned for late 2008, at a time mutually agreed by the Parties.

3. Considering that for both NASA and CONAE, the Aquarius instrument will perform the measurements needed to achieve the main objective of this mission, the Parties agree to grant this instrument priority over any other instrument for resources allocations, and operation of the Aquarius/SAC-D mission. The development, test and operations of any Party or third party instruments on Aquarius/SAC-D shall not diminish the science objectives and accommodation of the principal Aquarius instrument, or impact the schedule, the observatory resource allocations, and the cost to NASA or CONAE.

4. The Aquarius/SAC-D Ground System is comprised of a CONAE-provided ground station antenna system, the SAC-D Mission Operations Center, the CONAE data exchange file server, and the manpower support necessary to command, control, and monitor the health and safety of the SAC-D spacecraft, the NASA-provided Aquarius instrument, the CONAE-provided instruments, as well as the third parties' instruments.

5. The Parties will evaluate together the possible inclusion of additional instruments on the SAC-D spacecraft as part of, complementary to, or apart from the principal Aquarius/SAC-D objectives. The final selection of all additional instruments shall be made 2 months prior to the Project System Requirements Review (SRR).

6. After Aquarius/SAC-D SRR, the final configuration of the observatory is established, the project will inform NASA and CONAE if there is any excess launch capability available after accounting for adequate resource margins (volume and mass). If it is determined that adequate excess launch resources are available above the margins, NASA and CONAE may consider a dual launch adding an additional Earth observation mission. This possibility will only be considered if it is agreed to by both NASA and CONAE and that overall there are no additional risks to the Aquarius/SAC-D mission. A final decision for dual-launch must be made no later than 2 months prior to the Aquarius/SAC-D (Preliminary Design Review) PDR, and the terms and conditions for such mission will be documented in a separate agreement.

7. Consistent with the terms of this MOU, each Party may, with the agreement of the other Party, invite participation in Aquarius/SAC-D by other countries. Separate arrangements, outside of the scope of this MOU, will govern such cooperation.

Article III –CONAE Responsibilities

CONAE will use reasonable efforts to carry out the following responsibilities:

1. Develop, together with NASA, the Aquarius/SAC-D Project Implementation Plan (PIP).
2. Design, fabricate, test, integrate, calibrate, and transport to the launch site the complete Aquarius/SAC-D observatory suitable for deployment from the NASA-provided expendable launch vehicle.
3. Design, fabricate, test, calibrate, and integrate for launch pursuant to the schedule agreed in the Aquarius/SAC-D PIP, the CONAE-provided K-band radiometer, and a NIRST camera that will perform observations complementary to the Aquarius Mission.
4. Design, fabricate, test, calibrate, and integrate for launch pursuant to the schedule agreed in the Aquarius/SAC-D PIP the CONAE-provided High Sensitivity Optical Camera and Data Collector.
5. Integrate and test for launch, pursuant to the schedule agreed in the PIP, any third-party provided instruments.
6. Assure that the Aquarius/SAC-D observatory provides sufficient resources for the accommodation of the Aquarius instrument, as identified in the Aquarius/SAC-D PIP. Integrate the NASA-provided instrument payload with the Aquarius/SAC-D observatory.
7. Inform NASA promptly of any technical or programmatic problems that may affect overall Aquarius/SAC-D schedules, cost, or performance.
8. Participate in, and support the formation of, a Joint Steering Group (JSG) comprised of associates from CONAE and NASA.
9. Support the development of a joint NASA/CONAE Science Management Plan for the Aquarius/SAC-D Mission.
10. Provide system engineering and develop jointly with NASA supporting documentation that includes at least the spacecraft system requirements and an Aquarius Instrument to Spacecraft Interface Control Document. These documents should define the system functional and performance requirements and the NASA/CONAE interfaces, including the Aquarius instrument, ground system, and launch vehicle interfaces.
11. Establish requirements for overall payload and system-level testing, plan and perform payload and system-level tests, evaluate test results, and certify flight readiness.
12. CONAE together with NASA will evaluate the possible inclusion of additional instruments on the SAC-D spacecraft as part of, complementary to, or apart from the principal Aquarius/SAC-D objectives. Any additional payloads will follow the evaluation process identified in the Aquarius/SAC-D PIP.

13. Support end-to-end instrument system-level testing by performing functional tests of the Aquarius/SAC-D observatory, including assistance with testing of the payload data telemetry system with NASA-provided ground control and data archival centers.
14. Provide NASA with relevant pre-launch data, including mission requirements, design, constraints, analyses, safety, and operations information and any such additional equipment and documentation as may be required by NASA and agreed to in the Aquarius/SAC-D PIP.
15. Provide Ground Support Equipment (GSE) and qualified personnel to support the handling and testing of the Aquarius/SAC-D observatory prior to and during its integration, and operations with the launch vehicle, as mutually agreed.
16. Design, fabricate, and test the Aquarius/SAC-D Mission Operations Center (MOC) that will provide command capabilities and receipt of telemetry and scientific data.
17. Perform checkout, as mutually agreed, of the Aquarius/SAC-D spacecraft during the launch operations phase.
18. Conduct Aquarius/SAC-D mission operations and provide for routine operational data products during the operational lifetime as described in the Aquarius/SAC-D PIP, including support with the NASA provided ground network.
19. Reduce and distribute to NASA, in a timely manner, all data from the Aquarius/SAC-D instruments in a format and on a schedule as mutually agreed.
20. Support the CONAE-designated investigators in analyzing Aquarius/SAC-D data and publishing their findings.
21. Support periodic workshops and meetings for planning Aquarius/SAC-D activities.

Article IV –NASA Responsibilities

NASA will use reasonable efforts to carry out the following responsibilities:

1. Develop, together with CONAE, the Aquarius/SAC-D PIP.
2. Design, fabricate, test, calibrate, prepare for integration, and transport the NASA-provided instrument to the Aquarius/SAC-D observatory integration site and prepare the instrument for integration.
3. Launch the Aquarius/SAC-D observatory and inject it into the orbit agreed upon in the Aquarius/SAC-D PIP.
4. Provide support from the NASA-provided ground network for the operation of the Aquarius/SAC-D Mission during launch, early orbit, and for propulsion maneuvers and contingencies during the duration of the mission.
5. Design, fabricate, and test the NASA-provided Aquarius instrument science data processing system and the Aquarius instrument data archive and distribution system and perform end-to-end system-level testing, including system level testing between the payload data telemetry system and the NASA-provided ground system.

6. Command, monitor, and control the NASA instruments, including performing such evaluation and calibration activities as are required to verify the performance achieved on-orbit by the NASA instrumentation.
7. Participate in and support the formation of a JSG comprising representatives from CONAE and NASA.
8. Support the development of a joint NASA/CONAE Science Management Plan for Aquarius/SAC-D.
9. Inform CONAE promptly of any technical or programmatic problems that may affect overall Aquarius/SAC-D schedules, cost, or performance.
10. Support the development of requirements for overall payload and system-level testing, the planning and performance of payload and system level tests, evaluation of test results, and certification of flight readiness.
11. Assure that the Aquarius instrument resource allocation does not exceed the resource allocation identified in the Aquarius/SAC-D PIP.
12. Provide GSE and qualified personnel to support integration, testing, launch, operations, and data analysis of the NASA-provided payload with the Aquarius/SAC-D observatory as described in the Aquarius/SAC-D PIP.
13. Whenever appropriate, and as requested by CONAE, in the case of important delays or unexpected long procurement periods by U.S. suppliers, provide for the loan to CONAE of NASA components with the specific purpose of accelerating the SAC-D spacecraft development.
14. Provide suitable facilities at the launch site for spacecraft checkout and integrate the observatory with the launch vehicle and perform necessary tests and checkouts prior to launch.
15. Supply the hydrazine propellant for the Aquarius/SAC-D observatory, including the loading of the hydrazine into the fuel tank of the observatory at the launch site, with CONAE personnel present.
16. Provide technical advice and such additional equipment and documentation as may be agreed to in the Aquarius/SAC-D PIP.
17. Provide CONAE with required design and other information pertaining to payload satellite interfaces and on-orbit operations.
18. Provide CONAE with specifications of launch vehicle environmental conditions and safety requirements, and the specifications on the appropriate mechanical and electrical interfaces for use in preparing the Aquarius/SAC-D observatory for launch.
19. Verify compatibility of observatory interfaces with the launch vehicle.
20. Make processed Aquarius instrument data available to CONAE.
21. Make available requested Aquarius/SAC-D data to NASA-designated investigators in a form suitable for scientific analysis.
22. Support the NASA-designated investigators in analyzing Aquarius/SAC-D data and publishing their findings.

23. Support periodic workshops and meetings for planning Aquarius/SAC-D activities.
24. Include CONAE in the distribution list on components failure alert.

Article V – Aquarius/SAC-D Management

1. Each of the Parties will designate an Aquarius/SAC-D Project Manager who will be responsible for the overall management and implementation of the Aquarius/SAC-D Project. The Project Managers will jointly create the Aquarius/SAC-D PIP for the implementation of the detailed activities outlined in this MOU.

2. The Project Managers will decide all issues arising from the implementation of this activity. If they are unable to come to an agreement on a particular issue, the issue will be brought before the Joint Steering Group for a recommendation.

3. Each of the Parties will designate an Aquarius/SAC-D Principal Investigator who will be responsible for the overall management of the Aquarius/SAC-D Science activities.

Article VI – Aquarius/SAC-D Science Team

1. Principal Investigators: The Principal Investigators will oversee the work of the Aquarius/SAC-D Science Team and its interaction with the Aquarius/SAC-D Project. They will be jointly responsible for the development of the scientific aspects of the Aquarius/SAC-D mission and for assuring that the data are effectively used across the Aquarius/SAC-D Science Team and that the investigation results are expeditiously produced and made available. They will also be jointly responsible for coordinating science requirements, calibration and validation plans, and associated field experiments with other organizations.

2. Program or Mission Scientists: The Parties shall each designate a Program Scientist or Mission Scientist responsible for its contribution to interactions with the user community.

   The designated Program or Mission Scientists will in particular:
   a) Oversee the selection of an Aquarius/SAC-D Science Team;
   b) Stimulate relevant interactions between selected Aquarius/SAC-D investigators and the operational user community, including the establishment of agreed mechanisms for assessing the relevance of investigation results to future operational services;
   c) Ensure relevant scientific input and feedback of the operational community to the JSG.

3. Aquarius/SAC-D Science Team: The suite of activities within the Aquarius/SAC-D Science Team shall be selected through competitions in a manner as mutually agreed by the Parties. The activities will include scientific investigations and innovative application demonstration projects for Aquarius/SAC-D. NASA will select proposals to be funded by the United States and CONAE will select proposals to be funded by Argentinean funding agencies. The Parties

will jointly select investigators from outside the United States and Argentina that are not required to be funded by either Party. The Aquarius/SAC-D Science Team will be a contributor to geophysical calibration of Aquarius/SAC-D observatory and validation of data prior to release.

Article VII – Financial Arrangements

NASA and CONAE will each bear the costs of discharging their respective responsibilities, including travel and subsistence of personnel and transportation of all equipment and other items for which it is responsible. Further, it is understood that the ability of each Party to carry out their obligations is subject to the availability of appropriated funds. Should either Party encounter budgetary problems, which may affect the activities to be carried out under this MOU, the Party encountering the problems will notify and consult with the other Party as soon as possible.

Article VIII – Customs, Taxes, and Immigration

In accordance with its laws and regulations, each Party shall facilitate free customs clearance and waiver of all applicable customs duties and taxes for equipment and related goods necessary for the implementation of this MOU. In the event that any customs duties or taxes of any kind are nonetheless levied on such equipment and related goods, such customs duties or taxes shall be borne by the Party of the country levying such customs duties or taxes. The Parties' obligation to ensure duty-free entry and exit of equipment and related goods is fully reciprocal.

Each Party shall also facilitate provision of the appropriate entry and residence documentation for the other Party's nationals who enter, exit, or reside within its territory in order to carry out the activities under this MOU.

Article IX- Transfer of Goods and Technical Data

The Parties are obligated to transfer only those technical data (including software) and goods necessary to fulfill their respective responsibilities under this MOU, in accordance with the following provisions:

1. Nothing in this article requires the Parties to transfer goods or technical data contrary to national laws and regulations relating to export control or control of classified information.

2. The transfer of technical data for the purpose of discharging the Parties' responsibilities with regard to interface, integration, and safety shall normally be made without restriction, except as provided in paragraph 1 above.

3. All transfers of goods and proprietary or export-controlled technical data are subject to the following provisions. In the event a Party or its related entity (e.g., contractor, subcontractor, grantee, cooperating entity) finds it necessary to transfer goods or to transfer proprietary or

export-controlled technical data, for which protection is to be maintained, such goods shall be specifically identified and such proprietary or export-controlled technical data shall be marked. The identification for goods and the marking on proprietary or export-controlled technical data will indicate that the goods and proprietary or export-controlled technical data shall be used by the receiving Party or related entities only for the purposes of fulfilling the receiving Party's or related entity's responsibilities under this MOU, and that the identified goods and marked proprietary technical data or marked export-controlled technical data shall not be disclosed or retransferred to any other entity without the prior written permission of the furnishing Party or its related entity. The receiving Party or related entity shall abide by the terms of the notice and protect any such identified goods and marked proprietary technical data or marked export-controlled technical data from unauthorized use and disclosure. The Parties to this MOU will cause their related entities to be bound by the provisions of this Article related to use, disclosure, and retransfer of goods and marked technical data through contractual mechanisms or equivalent measures.

4. All goods exchanged in the performance of this MOU shall be used by the receiving Party or related entity exclusively for the purposes of the MOU. Upon completion of the activities under the MOU, the receiving Party or related entity shall return or, at the request of the furnishing Party or its related entity, otherwise dispose of all goods and marked proprietary technical data or marked export-controlled technical data provided under this MOU, as directed by the furnishing Party or related entity.

Article X - Intellectual Property Rights

1. Nothing in the MOU shall be construed as granting or implying any rights to, or interest in, patents or inventions of the Parties or their contractors or subcontractors.

2. In the event that an invention is jointly made by employees of the Parties, their contractors or subcontractors, during the implementation of this MOU, the Parties shall consult and agree as to the responsibilities and costs of actions to be taken to establish and maintain patent protection (in any country) for such invention and on the terms and conditions of any license or other rights to be exchanged or granted by or between the Parties.

3. Final results of the experiments will be made available to the scientific community through publication in appropriate journals or other established channels as soon as practicable and consistent with good scientific practice. In the event such reports or publications are copyrighted, NASA and CONAE shall have a royalty-free right under the copyright to reproduce, distribute, and use such copyrighted work for their purposes.

4. Releases may be made by the appropriate Party for its own portion of the program/cooperation as desired. Insofar as participation of the other Party is involved, the Parties will seek to consult with each other prior to any releases, consistent with the Parties' respective laws and policies.

Article XI – Science Data Policy

Access to Aquarius/SAC-D science data will be as follows:

1. In all cases, the Parties will provide access to all Aquarius/SAC-D science data and science data products, free of charge, for members of the science team, as well as designated representatives of science team members, including associates, staff and co-workers. The Parties will also provide free of charge, Aquarius/SAC-D science data and science data products necessary to the scientists selected for validation.

2. NASA and CONAE have the responsibility to make science data products available to the public and the science community in a mutually agreed standard data format and schedule.

3. Each Party will be required to archive science data and products generated from the payloads provided by the respective Parties as defined in the Aquarius/SAC-D PIP. Copies of the Aquarius/SAC-D science data products will be exchanged between the Parties.

4. The Aquarius/SAC-D science team members (including designated representatives) and scientists selected for validation must provide a report to the Parties on the results of their analysis and validation investigations.

5. All users, including the Aquarius/SAC-D science team members and scientists selected for validation, should provide a report to the Parties on the results of their investigations on validated Aquarius/SAC-D science data.

6. Notwithstanding any termination of this MOU by either Party, any science data products obtained from the Aquarius/SAC-D mission, as defined in the Aquarius/SAC-D PIP, will be archived by NASA and CONAE for at least 4 years after completion of the Aquarius/SAC-D mission, unless otherwise agreed by the Parties.

Article XII– Liability

1. The purpose of this Article is to establish a cross-waiver of liability between the Parties and the Parties' related entities in the interest of encouraging space exploration and investment. The cross-waiver of liability shall be broadly construed to achieve this objective.
2. For the purpose of this Article:
    a. Related Entity means:
        i. A contractor or subcontractor of a Party at any tier;
        ii. A user or customer of a Party at any tier; or
        iii. A contractor or subcontractor of a user or customer of a Party at any tier.
        "Contractors" and "Subcontractors" include suppliers of any kind.
    b. Damage means:
        i. Bodily injury to, or other impairment of health of, or death of, any person;
        ii. Damage to, loss of, or loss of use of any property;
        iii. Loss of revenue or profits; or
        iv. Other direct, indirect, or consequential damage.

    c. The term "launch vehicle" means an object or any part thereof intended for launch, launched from Earth, or returning to Earth which carries payloads or persons, or both.

d. The term “payload” means all property to be flown or used on or in a launch vehicle.

e. The term “Protected Space Operations” means all activities pursuant to this MOU, including launch vehicle activities and payload activities on Earth, in outer space, or in transit between Earth and outer space. It includes, but is not limited to:
    i. Research, design, development, test, manufacture, assembly, integration, operation, or use of launch or transfer vehicles, payloads, or instruments, as well as related support equipment and facilities and services;
    ii. All activities related to ground support, test, training, simulation, or guidance and control equipment and related facilities or services.
    iii. The term “Protected Space Operations” excludes activities on Earth which are conducted on return from space to develop further a payload’s product or process for use other than for the activity in question.

3. a. Each Party agrees to a cross-waiver of liability pursuant to which each Party waives all claims against any of the entities or persons listed in subparagraphs i. through iii. below based on damage arising out of Protected Space Operations. This cross-waiver shall apply only if the person, entity, or property causing the damage is involved in Protected Space Operations and the person, entity, or property damaged is damaged by virtue of its involvement in Protected Space Operations. The cross-waiver shall apply to any claims for damage, whatever the legal basis for such claims, including but not limited to delict and tort (including negligence of every degree and kind) and contract, against:
    i. the other Party;
    ii. a related entity of the other Party;
    iii. the employees of any of the entities identified in subparagraphs i. and ii.

b. In addition, each Party shall extend the cross-waiver of liability as set forth in paragraph 3.a. above to its own related entities by requiring them, by contract or otherwise, to agree to waive all claims against the entities or persons identified in subparagraphs 3.a.i. through 3.a.iii. above.

c. This cross-waiver of liability shall be applicable to liability arising from the Convention on the International Liability for Damage Caused by Space Objects, of March 29, 1972, where the person, entity, or property causing the damage is involved in Protected Space Operations and the person, entity, or property damaged is damaged by virtue of its involvement in Protected Space Operations. The provisions of this subparagraph shall be subject to the Parties’ respective governments taking the necessary measures to make this subparagraph legally effective. If the necessary measures to make this subparagraph legally effective are not taken prior to launch, neither Party shall be obligated to fulfill the responsibilities provided in Articles III and IV related to their respective launch and post-launch activities.

d. Notwithstanding the other provisions of this Article, this cross-waiver of liability shall not be applicable to:
    i. Claims between a Party and its own related entity or between its own related entities;

ii. Claims made by a natural person, his/her estate, survivors, or subrogees for bodily injury, other impairment of health or death of such natural person, except where a subrogees is one of the Parties;
iii. Claims for damage caused by willful misconduct;
iv. Intellectual property claims;
v. Claims for damage resulting from a failure of the Parties to extend the cross-waiver of liability as set forth in paragraph 3.b. or from a failure of the Parties to ensure that their related entities extend the cross-waiver of liability as set forth in paragraph 3.b.; or
vi. Contract claims between the Parties based on the express contractual provisions.

e. Nothing in this Article shall be construed to create the basis for a claim or suit where none would otherwise exist.

Article XIII- Registration of Space Objects

CONAE will request that the Government of Argentina register the Aquarius/SAC-D observatory as a space object in accordance with the Convention on Registration of Space Objects Launched into Outer Space of January 14, 1975. Registration pursuant to this section will not affect the rights or obligations of either Party or its Government under the 1972 Convention on International Liability for Damage Caused by Space Objects.

Article XIV– Settlement of Disputes

Any dispute arising out of the interpretation or implementation of this MOU shall be resolved through negotiations between the Parties through the Aquarius/SAC-D JSG. In the event the JSG is unable to resolve the dispute, it will be referred to the NASA Administrator and the Executive and Technical Director of CONAE or their designees for joint resolution.

Article XV- Entry into Force, Duration, Amendment, and Termination

This MOU will enter into force upon signature and remain in force until 5 years after the Aquarius/SAC-D observatory has been launched, or for a period of 10 years, whichever occurs first. This MOU may be amended and extended by written agreement of the Parties. Either Party may terminate this MOU at any time upon at least 12 months written notice to the other Party. In that event, the Parties will endeavor to minimize negative impacts of such termination on the other Party.

Termination of this MOU will not affect a Party's continuing obligations under Articles V, VIII, IX, X, XI, and XII of this MOU concerning Aquarius/SAC-D Management; Transfer of Goods and Technical Data; Customs, Taxes, Immigration, Intellectual Property Rights; Science Data Policy; and Liability, unless otherwise agreed by the Parties.

Done, in duplicate, at Buenos Aires, Argentina this second day of March, 2004, in the English and Spanish languages, both texts being equally authentic.

FOR THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION OF THE UNITED STATES:

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FOR THE COMISION NACIONAL DE ACTIVIDADES ESPACIALES OF ARGENTINA:

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